

Climate Ready Estuaries (CRE) draft work plan for Santa Monica Bay Restoration Commission

Project title: Adapting to the Multiple Impacts of Climate Change in an Inter-Connected Urban Watershed-Wetland System

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Abstract

This project will use model predictions to determine local impacts of climate change within the Ballona Wetland and Watershed. Results of this study will be used to inform wetland habitat restoration, channel naturalization, BMP and TMDL projects that are planned in the Ballona Wetland and Watershed.

There is broad consensus that communities must prepare to adapt to climate change. Potential changes that need to be addressed locally in the Santa Monica Bay area include coastal erosion and inundation caused by sea level rise, increase in the occurrence of extreme precipitation events, both flood and drought, changes in the water balance and the salinity regimes of sensitive habitats, such as seasonal wetlands and brackish marshes.

To make Santa Monica Bay “climate ready,” the Santa Monica Bay Restoration Commission (the Santa Monica Bay NEP) incorporated new objectives in its CCMP (the Bay Restoration Plan) in 2008, with input from hundreds of stakeholders and our Technical Advisory Committee. One new objective related to climate change calls for two important actions to address the potential impacts of climate change: further evaluation of the expected impacts and severity, and development of adaptive strategies based on an understanding of the potential impacts. The 2010 State of the Santa Monica Bay report also identifies climate change as an emerging challenge for Santa Monica Bay and its watershed, with sea level rise and drought at the top of the list of potential concerns.

A regional climate change adaptation working group (the Los Angeles Regional Collaborative for Climate Action and Sustainability, or LARC) was formed recently. Administered by UCLA Institute of the Environment, LARC is a collaborative of Los Angeles County, municipalities within the County, regional transportation agencies, clean air groups, and other organizations in an effort to unify the region’s plan in addressing the impacts of climate change. LARC plans to develop and utilize modeling tools to predict variables such as ocean levels, heat waves, smog days, fire dangers, temperature increases, energy use and ecosystem changes. LARC also plans to develop scenarios of how water use, land use, and energy use should change. The results of these studies will be used to inform development of a climate action plan for the entire region. However, condition of the research grants received by LARC will limit its initial effort to addressing the impact of climate

changes on energy use, such as carbon registry, greenhouse gas source inventory the region's need and potential for developing renewable energy such as solar and wind infrastructure.

The primary objective of this project is to inform ongoing planning efforts of potential climate impacts to ongoing restoration, and water quality improvement projects within the Ballona Wetland and Watershed. More specifically, this project will

- i. Investigate climate change effects under different modeling scenarios in a highly urbanized coastal watershed and wetland (Ballona Creek Watershed and Ballona Wetlands), using a high-resolution localized modeling tool;
- ii. Use modeling results to recommend adaptive management strategies to wetlands managers, and to recommend changes to coastal policy such as local coastal plans and others; and
- ii. Disseminate the results of the investigation and adaptation recommendations to a broad regional audience and serve as a model for other climate change adaptation efforts.

The modeling results and policy recommendations will be provided and incorporated into LARC region-wide adaptation plan.

The project will be coordinated with LARC's research efforts. The project differs from, but complement LARC's large-scale regional effort by focusing on the impacts of sea level rise and changing precipitation characteristics on a heavily urbanized sub-region (Ballona Watershed and Wetlands), and creating adaptation recommendations for wetlands management and other coastal development policies. All of which are critical data gaps that LARC is currently unable to fill. During this study, members of LARC will have input on the study methodology to ensure the results fit with the needs of their agencies and groups. LARC will also help disseminate the results of the project to its member organizations and provide them with adaptation recommendations that can be readily adopted by municipalities and water agencies. Eventually, the results of this project will be incorporated into the regional adaptation plan to be developed by LARC.

This project will also collaborate with the USC Sea Grant's on-going project on Climate Adaptation in Urban Coastal Communities. Specifically, we will participate in the coastal community stakeholder workshops planned by Sea Grant to share our knowledge on climate change impacts, gather input regarding current knowledge and capacity in implementing adaptation strategies at the local level, and explore feasibility of incorporating climate changes into local planning documents.

Task 1 - Analysis of Historical Data: To develop an understanding of the hydrometeorological processes in the Ballona Creek watershed, historical precipitation, streamflow, and tidal data for the region will be analyzed. The Streamflow records will be obtained from the United States Geological Survey, Los Angeles County Flood Control District and Army Corps of Engineers, the precipitation data from the California Department of Water Resources, the National Oceanic and Atmospheric Administration's (NOAA's) National Climatic Data Center and Los Angeles County Flood Control District, and the tidal data from NOAA's Center for Operational Oceanographic Products and Services. The precipitation and flood flows associated with various return periods (i.e., the interval of time between events of a certain intensity) ranging from 10 years to 100 years will be determined.

Task 2 - Simulation of Current Climatic Conditions: Historical data will be used to calibrate SWMM and EFDC models to simulate the current conditions of the Ballona Watershed and Wetlands.

Task 3 - Simulation of Proposed Sustainable Alternatives with Current Climatic Conditions: Sustainable restoration design alternatives for the Ballona Wetlands include concepts ranging from little change to the existing conditions to full restoration of creek-wetland-tidal connections and a natural, unrestricted creek channel. These potential sustainable alternatives will be simulated within EFDC for each of the return flows generated from SWMM. If feasible, salinity and pollutant concentrations will be modeled to determine potential impacts to ecosystem distribution and health. The results from this phase will provide an understanding of sustainability of the proposed alternatives under the current climatic conditions.

Task 4 - Analysis of Climate Change Projections: In this phase, climate change projections for the Los Angeles area for 2050 and 2100 will be used to analyze climate change impacts in the watershed and wetlands. Primary variables of interest are the means and extremes of precipitation and sea level rise. Data sources will include NSF's North American Regional Climate Change Assessment Program (in which Dr. Pal participates), the IPCC Data Distribution Centre (DDC), and projections generated by the Dr. Pal and collaborators.

Task 5 - Simulation of Proposed Solutions with Projected Climatic Changes: Wetlands restoration design alternatives from Task 3 will be simulated based on the climate change projections of precipitation from Task 4. The simulations will be performed under different emissions scenarios for 2050 and 2100 by adding the projected percentage changes in precipitation to the observations. Sea-level rise projections will come from IPCC which range from 0.2 to 0.6 meters and from more recent assessments, which range from 0.8 to 2.0 meters by 2100. If feasible, salinity and pollutant concentrations will be modeled to determine potential impacts to ecosystem distribution and health. The results from these simulations will provide information about the sustainability of the wetlands over the next century.

Task 6 - Recommend coastal wetlands management and policy changes for climate change adaptation: The results of the modeling will be used to make recommendations to Ballona Watershed and Wetlands management agencies to ensure management actions and restoration designs are adaptive to predicted climate change impacts. Specific changes will be incorporated into the wetland restoration plan document as well as the long-term management and monitoring plan documents. Modeling results will also be generalized to provide recommendations to other coastal management agencies to change policies associated with local coastal plans and others policy/management tools. Policy and management analyses will be conducted in collaboration with the LARC and USC Sea Grant partners who are familiar with existing policies.

Task 7 - Disseminate information to regional stakeholders: Dissemination mechanisms for findings and recommendations from this study will include:

- Provide information to state agencies involved in Ballona Watershed management agencies.
- Provide information to LARC, making presentations to LARC members, and incorporate policy recommendations into the LARC regional adaptation plan.
- Provide information to the state's Ballona Wetlands Restoration Planning process for incorporation into the restoration design.
- Provide information to the Army Corps' Lower Ballona Ecosystem Restoration Feasibility Study through data transfer, open dialogue, and presentation of results.
- Transfer study results and make presentations to state and local agencies (e.g. Coastal Commission, coastal cities) and, local coastal communities (in collaboration with USC Sea Grant) other National Estuary Programs
- Presentations by researchers and/or students at conferences and symposiums.

Tasks, deliverables, and project milestones are listed in the table below.

Work products/Milestones

Products	Critical milestones and deliverables	Start and projected completion dates	Lead(s)
Climate Model Development	Review current watershed and wetland hydrology models	Oct.- Nov. 2010	JP and SB
	Review current temperature and precipitation models	Oct.- Nov. 2010	JP
	Develop temperature and precipitation model for Ballona Watershed	Nov.- Dec. 2010	JP
	Develop watershed and wetland hydrology models using predicted changes	Dec.- Jan. 2010	JP and SB
Climate Model Analysis	Review current restoration and water quality improvement projects & models	Oct.- Nov. 2010	SB
	Apply model to potential future wetland and watershed conditions	Jan.- Mar. 2011	SB and JP
	Analyze ecological and water quality conditions under future conditions	Mar.- Apr 2011	SB and JP
	Prepare final report including policy and planning recommendations	May – June 2011	SB and GW
Public Outreach and Dissemination of Results	Engage local efforts to develop climate adaptation strategies	Oct.2010-Sept.2011	GW and SL
	Review local BMP, TMDL, LID and other water quality policies	Oct.2010-Mar.2011	GW and SB
	Provide recommendations to change current planning efforts and policy	Mar. – June 2011	GW and SB
	Disseminate recommendations to local agencies and organization regarding current policies and the potential impacts of climate change	June – Sept. 2011	GW, SL and SB

Note: Shelley Luce will provide oversight and conduct review throughout the project

JP – Jeremy Pal, SB – Sean Bergquist, GW – Guangyu Wang, SL – Shelley Luce

Additional resources required to complete work

This project will require climate and hydrology data necessary to complete the project (the project will rely on publicly available data), model software and computers to run the models (provided by Loyola Marymount University), travel and meeting, and report reproduction expenses.

Anticipated issues/Assumptions

This project assumes suitable climate and hydrology data will be available to develop adequate models for the Ballona Watershed and Wetlands.

Anticipated issues: 1) Current projects and policies have been developed to provide water quality improvements under current conditions, using such benchmarks as $\frac{3}{4}$ inch or 85th percentile storms. These benchmarks may not be sufficient or may change with future conditions. A $\frac{3}{4}$ inch storm may not capture enough storm water if future conditions include increased precipitation, and the 85th percentile storm will also change. 2) Restoration in an urban environment involves limited space to accommodate potential climate change impacts. Rising sea levels will impact coastal wetland restoration projects; they will gain habitat in the lower tidal range (subtidal and mudflats) at the expense of higher elevation habitats at the perimeter of the project.

Expected challenges	Actions to overcome
Engaging projects driven by regulation to accommodate future climate conditions.	Include regulatory agencies and local agencies implementing projects during the outreach phase of the project.
Accommodating SLR predictions in limited space available for coastal wetland restoration.	Include appropriate slopes in restoration design to allow transgression of habitats to minimize large shifts of habitat types.

Other involvement

Other groups that may be involved in this project include: the Los Angeles Regional Water Quality Control Board, State Coastal Conservancy, Department of Fish and Game, State Lands Commission, Los Angeles County Department of Public Works, City of Los Angeles Department of Public Works (Bureau of Sanitation), and members of the Los Angeles Regional Collaborative for Climate Action and Sustainability.